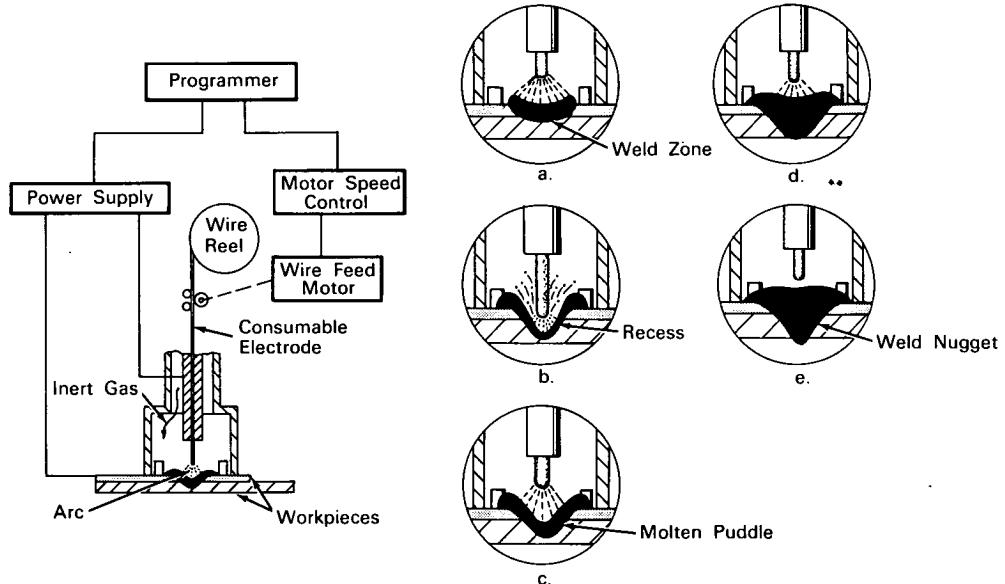


# NASA TECH BRIEF



This NASA Tech Brief is issued by the Technology Utilization Division to acquaint industry with the technical content of an innovation derived from the space program.

## Welding Procedure Improves Quality of Welds, Offers Other Advantages



**The problem:** Devising an improved procedure for arc spot welding using the SIGMA (submerged inert gas metallic arc) method to yield welds of higher quality than are obtainable by conventional procedures.

**The solution:** Programming the welding operation to ensure proper penetration of the electrode material in a recess, under conditions that prevent the formation of oxides, and gradually to build up a molten puddle where trapped gases rise and escape from the surface. This procedure minimizes porosity and thermal cracking of the welded joint.

**How it's done:** After striking an arc between the consumable electrode and the workpieces, the temperature and length of the arc are varied by a predetermined program to preheat the weld zone of the workpieces to a substantially molten condition (detail a). Sufficient metal is then blown out of the weld zone to form a deep recess (detail b). The sides of the recess are melted (detail c) and a puddle is gradually built up within the recess (detail d) to form a weld nugget (detail e) when the arc is interrupted.

### Notes:

1. This procedure offers the following additional advantages over standard resistance spot welding

(continued overleaf)

and SIGMA welding: lower cost and power; less stringent requirements for surface cleanliness; difference in thickness of workpieces is not important; access to only one side of workpieces is required; and the equipment is portable.

2. Inquiries concerning this invention may be directed to:

Technology Utilization Officer  
Marshall Space Flight Center  
Huntsville, Alabama, 35812  
Reference: B64-10309

**Patent status:** NASA encourages the immediate commercial use of this invention. It was invented by NASA employees and a patent application has been filed. Inquiries concerning license rights may be made directly to the inventors, Mr. William M. McCampbell and Mr. James C. McCaig at Marshall Space Flight Center, Huntsville, Alabama, 35812.

Source: Marshall Space Flight Center  
(M-FS-32)